City of Aurora

Water Department
Administration
Phone: 303-739-7370
Fax: 303-739-7491

APR 0 8 2010

AURORA WATER

April 6, 2010

Ms Wendy Chueng
United States Environmental Protection Agency
Ground Water Protection Program, 8P-W-GW
1595 Wynkoop Street
Denver, CO 80202-1179

RE: Additional Comments from Aurora Water Concerning Deep-well Injection Permit Application for East Cherry Creek Valley Water and Sanitation District (ECCV)

Dear Ms. Cheung,

The City of Aurora has had further discussions with ECCV over its planned deep well injection operations since the date of our last comment letter. Aurora's concerns have been satisfactorily addressed by ECCV and you need not further consider our comments in formulating your decision on the requested permits. Thank you.

Sincerely,

Mark T. Pifher
Director, Aurora Water

Cc: Dave Kaunisto, East Cherry Creek Water and Sanitation District
Kip Scott, East Cherry Creek Water and Sanitation District
Pat O'Brien, Hydrokinetics
Dave Bennett, Denver Water
Mike McHugh, Aurora Water

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Aurora All-America City 2008

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United States Environmental Protection Agency
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RE: Comments from Aurora Water Concerning Deep-well Injection Permit Application for East Cherry Creek Valley Water and Sanitation District (ECCV)

Procedural:
The lack of a publication date or comment period deadline on the Statement of Basis and Public Notice constitutes inadequate notice, so Aurora Water is requesting a formal extension of the comment period for 30 days. An oral request was made for this extension in a telephone conversation between Wendy Cheung (EPA) and Michael McHugh (Aurora Water) on Tuesday, March 2 and was denied by Ms. Cheung. However, Aurora Water is asking EPA to reconsider this extension request based on the comments submitted below.

Other technical mistakes need to be corrected and/or amended so proper comments can be prepared. Specifically, the language in the Statement of Basis at the bottom of page two describing the alternative well location is vague about where the well will be located and how it will be utilized. Is there a fourth well that is the alternative for ECCV DI-3, or is ECCV DI-3 the alternative location for one of the other two listed wells? The legal description for ECCV DI-1 appears to be incorrect; it appears that the well should be located in the SWSW of Section 1 T1S, R66W. Is this assumption correct? In addition, the permit is unclear about the term of the permit. Is the permit in effect for 10 years from the date of issuance or 10 years from the date of final well construction?

There is not adequate time to review all of the seismic literature and prepare precise comments in the allotted comment period. However, below is a summary of our concerns identified to date:

Discussion:
The proposed location of the East Cherry Creek Valley Water and Sanitation District (ECCV) waste injection wells is very close to the Rocky Mountain Arsenal (RMA) waste injection well--about 12 miles to the southwest. This arsenal was used by the U.S. Army and others to dispose of hazardous waste in the 1960s.

Over 1500 earthquakes—some of them exceeding 5.0 M, were triggered by these practices. Although there was no surface expression of faulting in the area, the earthquake epicenters were in a tight NW-SE trending swarm surrounding the injection well over a distance of four to six miles. Damage extended up to forty miles away. Several authorities attributed these quakes, some of which caused considerable property damage, to the injection practices at the RMA.

In addition, the City of Aurora has completed new facilities for the $750M Prairie Waters Project within 6 miles of the nearest proposed injection well. These facilities could be affected if the proposed wells create ground movement. Several detailed journal articles regarding the RMA injection wells should be reviewed by the EPA before a permit is considered. A more complete bibliography is provided at the end of these comments, but Waste Disposal and Earthquakes at the Rocky Mountain Arsenal, Derby Colorado by H.K. van Poolen and D.B. Hoover, (Journal of Petroleum Technology August 1970) provides detailed technical information of how the injection well was constructed and operated.

Experiments with injection of water and oil and gas wastes at the Rangely Oil field and in the Paradox Basin also provided a proven link to injection and earthquakes. The literature is resplendent with details that should be considered prior to the issuance of a permit.

In light of these uncertainties, ECCV should provide a detailed geological and geophysical analysis that will demonstrate there is no chance their brine waste injection program will cause any seismic disturbances. ECCV has indicated that it intends to inject wastes in the following formations: Lyons, Lower Satanka, Wolfcamp, Amazon, Council Grove, Admire, Virgil and Missourian. The US Army had proposed to inject waste into similar formations before they constructed their well, but found as construction proceeded, and the formations were cored, they needed to abandon several of those sections because the porosity was significantly less than optimum due to silicafication. The U.S. Army then resorted to injection into the Precambrian, the deepest formation penetrated by the well. ECCV should be prepared to find an alternative injection site should the formations they have chosen for injection be unsuitable.

Specific Comments on the Statement of Basis

On page three, the following sentence is written like a permit condition: "The first deep brine well should be completed within a year after the final permit to be able to deliver treated water in 2011." Is this an EPA requirement, or a planning date aspired to by ECCV? The section entitled Permit Considerations (40 CFR 146.24), Hydrogeologic Setting is very brief with an insufficient discussion of the hydrogeologic properties of each of the stratigraphic formations that are present at the location of the well (also, 40 CFR 146.24 refers to Class II wells; 40 CFR 146.14 refers to Class I wells). This section should include at least a list and summary of the documents upon which the Director is basing his decision. The discussion of the oil and gas resources in this section titled hydrogeology has little bearing on the decision at hand. Again, there is no specific hydrogeologic information disclosed.

In Table 2.1 Geologic Setting, the list of formation names is useful, but the deeper Permian and Pennsylvanian formation names may be unfamiliar to reviewers that are not familiar with the change in facies from the fountain formation. A correlation chart would be useful in understanding how these intervals were identified. Is the nomenclature consistent with the RMAG atlas? The formation descriptions on page six should indicate where the observation point is to decode phrases like "The Pennsylvanian Missouri is interbedded cream to dark brown, locally cherty and oolitic limestones and dark gray to black shales with some light traces of tan sandstone. Increasing sandstones and red shales westward. [sic]" Were these observations made locally at the proposed drilling site from drilling cores or from the type localities that might be hundreds of miles away?

A discussion of the series of wrench faults that are present in the area (at the Wattenberg and Third Creek oil and gas fields) should be presented in this section (see Guide to the Petroleum Geology and Laramide Orogeny, Denver Basin and Front Range, Colorado by Robert J. Weimer, 1996 CGS Bulletin 51).

Finally, on the bottom of page six there was a reference to "deep wells several miles away" - how far away and how deep are the referenced wells?

On page eight, the reference to the Laramie-Fox Hills is discussing an important aquifer, but the description is for the two formations, the Laramie and the Fox Hills. The aquifer occurs in the sandier members of each formation.

On page eleven, as a courtesy to the reviewer, the table reflecting the UIC definition should be included. The proposed limits in the Injection Pressure Limitation section (page 12) should be compared with the observed and recorded limits that triggered the earthquakes at the RMA (see H.K. van Poolen and D.B. Hoover, 1970).

Aurora Water believes that in light of the overwhelming evidence that waste injection has caused earthquakes in the vicinity of the RMA, and that faulting has been observed in a number of oil and gas wells from the area, an injection volume limitation should be imposed that can be safely monitored and increased over time until full operations are established. A proposed injection schedule and a table of maximum total injected volumes should be included as a permit condition.

In addition, since the chemical composition of the brine is presently unknown, geochemical modeling of the likely interactions of the proposed brine solution and the receiving groundwater should be conducted prior to the issuance of the permit. This modeling could be useful to ECCV in order to avoid possible injection performance issues due to chemical precipitation and formation plugging.

After reviewing Part IV, Monitoring, Recordkeeping and Reporting Requirements (pages 13-14), Aurora Water finds the proposed program inadequate to ensure that there will not be the inadvertent triggering of seismic activity. We propose the following monitoring conditions:

1. Local background seismic data should be collected for a period of at least two years prior to the construction of any deep injection well and then during the testing and first year of operation.
2. A three-dimensional seismic survey capable of detecting any significant underground geologic structure must be conducted before drilling commences.
3. Core samples should be taken at the proposed injection intervals for geotechnical analysis including testing for hydraulic conductivity (transmissivity), porosity and faulting.
4. A plan for testing and phasing in operations needs to be developed. The plan should include pre-determined action levels for the curtailment of operations for any observed seismicity above the action level.
5. The attached list of references should be reviewed for applicability in the design and operation of any deep injection well to be constructed in conjunction with this permit.

With respect to Part VIII. Financial Responsibility (40 CFR 144.52), Aurora Water urges EPA and ECCV to consider the state of the law as provided in Colorado Law & Induced Seismicity by Darlene A. Cypser, 1996 (http://www.darlenecypser.com/induceq/ColoradoLawandInducedSeismicity.html).

Conclusion

It would appear that ECCV is cutting corners with respect to the research and planning of this project. While deep injection may be a technology that can be used to dispose of the brine generated by their water treatment plant, the proposed location is too close to an area that was the world –wide example of how waste injection can induce seismic activity. Perhaps the final paragraph from van Poollen and Hoover's article says it all:

"The RMA well is the first known disposal well to have triggered earthquakes. It has also triggered interest among seismologists who now recognize the importance of fluid pressure to rock movement. In light of all this, let the waste disposal engineer be warned that no underground disposal project is routine." (van Poollen and Hoover, 1970).

This project should only proceed with the utmost caution and oversight. If you have any questions regarding these comments or wish to discuss this further with Aurora Water before making a decision regarding our extension request, please contact me at (303) 739-7006.

Respectively Submitted,

Michael F. McHugh, P.G.
Permitting Coordinator, Aurora Water

Encl: As Stated
Cc: Dave Kaunisto, East Cherry Creek Water and Sanitation District

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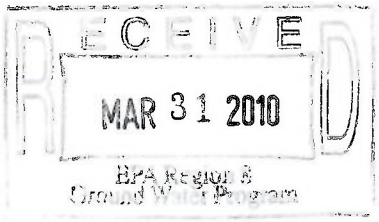

Aurora All-America City 2008

March 30, 2010

Ms Wendy Chueng
United States Environmental Protection Agency
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1595 Wynkoop Street
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RE: Additional Comments from Aurora Water Concerning Deep-well Injection Permit Application for East Cherry Creek Valley Water and Sanitation District (ECCV)

Thank you for agreeing to extend the comment period for public comment on ECCV's permit application. The extension gave Aurora Water and others a chance to meet with ECCV to understand their application in more detail. On March 23, 2010 representatives from Aurora Water and Denver Water met with ECCV Project Manager Kip Scott and ECCV's consultant Pat O'Brien from Hydrokinetics to discuss the comments submitted by Aurora Water on March 5, 2010.

Mr. Scott and Mr. O'Brien shared the letter dated March 19, 2010 with Wendy Chueng responding to our comments. Aurora Water's incidental comments and questions were addressed in that letter and at our meeting. Aurora Water's principle concerns are 1) the proposed receiving sedimentary formations may not be porous enough to accept the injected waste; and 2) there is not a sufficient seismic baseline to evaluate any changes that may occur as a result of ECCV's actions. These concerns were not fully addressed in either the letter or at the March 23rd meeting. However, at the meeting, Denver Water and Aurora Water received assurances that in the event of any unforeseen seismic activity, ECCV would immediately curtail any injection activity. ECCV expressed concerns that Aurora and Denver were asking for additional permitting requirements not supported by law or regulation. On the contrary, Aurora Water only wants to make ECCV and EPA aware of our concerns on the record. We felt that in light of the lingering questions, ECCV would want to set an accurate baseline against which their activities could be measured.

As for the injection wells cited in ECCV's March 19th letter, many of the COGCC wells inject their wastes back into the formations that are producing the oil and gas to enhance recovery and are not injecting into the same formations that are proposed in ECCV's permit application. It is rare for oil and gas producers to inject waste into the intervals identified in the application because they are deeper than the oil and gas producing formations. It is also unclear to us whether the referenced Suckla Farms injection well is injecting waste into the same stratigraphic formations proposed in ECCV's application and is therefore a comparative operation.

Finally, Kip Scott and Pat O'Brien indicated at the March 23rd meeting that a second permit to inject waste would be required after the construction of the well was complete. In my conversation with you this morning (March 30, 2010), you indicated that this was not the case and that this was the only opportunity for Aurora Water to make public comment. At this time, please add these comments to the record.

Thank you again for extending the comment period.

Respectively Submitted,

Michael F. McHugh, P.G.
Permitting Coordinator, Aurora Water

Cc: Dave Kaunisto, East Cherry Creek Water and Sanitation District
Kip Scott, East Cherry Creek Water and Sanitation District
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